Abstract Submitted for the DPP16 Meeting of The American Physical Society

Simultaneous profile measurements of medium- and high-Z impurity concentrations (n_Z/n_e) , T_e , ΔZ_{eff} and $n_e^2 Z_{eff}$ in MCF plasmas from multi-energy x-rays JACOB MADDOX, LUIS DELGADO-APARICIO, NOVIMIR PABLANT, MAX RUTMAN, KEN HILL, MANFRED BITTER, Princeton Plasma Physics Lab., MATTHEW REINKE, Oak Ridge National Lab., JOHN RICE, MIT Plasma Science Fusion Center — Novel energy resolved measurements of x-ray emissions were used to characterize impurity concentrations, electron temperature, and ΔZ_{eff} in a variety of Alcator C-Mod plasmas. A PILATUS2 detector programmed in a multi-energy configuration and used in a pinhole camera geometry provides the capability to function similar to a pulse height analyzer (PHA) but with full plasma profile views and sufficient spatial (1 cm), energy ($^{.5}$ keV), and temporal (~10 ms) resolution. Each of the PILATUS2's ~100k (487x195) pixels can be set to an energy threshold, which sorts x-ray emissions into energy bins by counting only photons with energy above the threshold energy. By setting every 13th pixel row to the same energy bin and the 12 interjacent pixel rows to different energy bins on the PILATUS2 detector gives 38 poloidal sightlines (487 rows/13 energy bins). The number of photons detected in each energy bin depends on (n_Z/n_e) , T_e , and $n_e^2 Z_{eff}$, so that these plasma parameters can be extracted by fitting the data to an emission model, which includes free-free, free-bound, and bound-bound emissions from a De/H background plasma with perturbing medium and high-Z impurities, like intrinsic Mo, Fe, and Cu or injected W. Also, radial electron temperature profiles were measured during LHRF and ICRF and compared to Thomson scattering and ECE.

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Date submitted: 20 Jul 2016

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